

REMARKS

The Examiner rejected claims 1-12 under 35 U.S.C. §103(a) as being unpatentable over Amako in view of Shiobara because the Examiner believes that Figure 1 of Amako shows a semiconductor wafer, which inherently possesses an active surface, bonding pads, and a cured silicone covering a portion of the active surface, and the silicone member comprising an organopolysiloxane containing an average of at least two silicon-bonded alkenyl groups per molecule, an organohydrogensiloxane containing an average of at least two silicon-bonded hydrogen atoms per molecule, an inorganic filler, and a hydrosilylation catalyst, and heating the silicone deposit to form the cured silicone member. The Examiner concludes that Amako discloses a cured silicone member having the same composition as Applicant's disclosure, and it is obvious that the cured silicone of Amako has a coefficient of linear expansion and a modulus in a vicinity of the range recited in the pending claim.

The Examiner further argues that Amako substantially the entire claimed structure. However, the Examiner admits that Amako fails to disclose an inorganic filler with a surface area less than 25 m²/g. The Examiner further argues that Shiobara discloses a filler used in a curable resin and having a surface area less than 25 m²/g for semiconductor packaging. The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a proper particle size distribution for the cured silicone based on the disclosure of Shiobara to a semiconductor device of Amako.

The Examiner further argues that claim 1 does not exclude silicon-bonded hydrogen atoms in the organopolysiloxane composition. The Examiner further argues even though Amako discloses that a filler material is needed for curable organopolysiloxane, Shiobara is referred to meet a specified limitation of the filler. The examiner further argues that the filler material of Shiobara is identical material to the one disclosed in the pending application and meets the recited limitation.

Amako discloses a curable organopolysiloxane composition comprising (A) an organopolysiloxane containing an average of at least two alkenyl groups and at least two silicon-

bonded hydrogen atoms per molecule, (B) a compound containing alkenyl and hydroxyphenyl groups in each molecule, and (C) a hydrosilylation catalyst (paragraph [0008]). The composition may contain reinforcing fillers for the purpose of improving the strength (paragraph [0038]). Amako further discloses a unified article comprising a substrate and a cured product of the organopolysiloxane composition (paragraph [0040] and Figure 1). The unified article may be an epoxy resin substrate having a silicon chip thereon and a cured product of the organopolysiloxane composition (Figure 1). The problem to be solved by Amako is to provide a curable organopolysiloxane composition wherein the silicone component that out-migrates by effusion from the composition is highly curable and adherent to a variety of substrates and the organopolysiloxane composition has excellent adhesion to a wide variety of substrates (paragraphs [004] and [0006]).

Shiobara discloses a method for fabricating semiconductor devices of the flip-chip design (col. 1, lines 4-5). The problem to be solved by Shiobara is to provide a method, which ensures the space between a substrate and a semiconductor chip is filled with a resin encapsulant without generating voids and without damaging solder bumps, and which ensures encapsulation is completed within a short time (col. 1, lines 29-37). Shiobara discloses an encapsulating resin composition comprising an epoxy resin, a curing agent, and an inorganic filler (col. 1, lines 61-64). The inorganic filler has a particle size distribution selected to prevent voids and solder bump failure and viscosity increase, which requires to increase molding pressure, sometimes causing solder bump failure (col. 7, lines 1-19). Shiobara does not disclose any silicone compositions.

This invention relates to a semiconductor package comprising:

a semiconductor wafer having an active surface comprising at least one integrated circuit, wherein each integrated circuit has a plurality of bond pads; and

at least one cured silicone member covering at least a portion of the active surface, wherein at least a portion of each bond pad is not covered by the silicone member, the silicone member has a coefficient of linear thermal expansion of from 60 to 280 $\mu\text{m}/\text{m}^\circ\text{C}$ between -40 and 150°C and

a modulus of from 1 to 300 MPa at 25 °C, and the silicone member is prepared by a method comprising the steps of:

(i) printing a silicone composition on the active surface to form a silicone deposit, wherein the silicone composition comprises:

(A) an organopolysiloxane containing an average of at least two silicon-bonded alkenyl groups per molecule with any remaining silicon-bonded organic groups being independently selected from monovalent hydrocarbon groups free of aliphatic unsaturation or monovalent halogenated hydrocarbon groups free of aliphatic unsaturation,

(B) an organohydrogensiloxane containing an average of at least two silicon-bonded hydrogen atoms per molecule in a concentration sufficient to cure the composition,

(C) an effective amount of an inorganic filler having a surface area less than 25 m²/g, and

(D) a catalytic amount of a hydrosilylation catalyst; and

(ii) heating the silicone deposit for an amount of time sufficient to form the cured silicone member.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the applicant's disclosure MPEP §2142, 2143. Even where the combination of the references taught every element of the claimed

invention, however without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper MPEP §2143.01. The level of skill in the art cannot be relied upon to provide the suggestion to combine references MPEP §2143.01. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination MPEP §2143.01.

Nothing in the disclosures of Amako and Shiobara would motivate one skilled in the art to combine them. The problem to be solved by Amako is to provide a curable organopolysiloxane composition wherein the silicone component that out-migrates by effusion from the composition is highly curable and adherent to a variety of substrates and the organopolysiloxane composition has excellent adhesion to a wide variety of substrates (paragraphs [004] and [0006]). The problem to be solved by Shiobara is to provide a method, which ensures the space between a substrate and a semiconductor chip is filled with a resin encapsulant without generating voids and without damaging solder bumps, and which ensures encapsulation is completed within a short time (col. 1, lines 29-37). Shiobara does not teach or suggest any silicone compositions. Nothing in the disclosure of Shiobara teaches or suggests that the inorganic filler in the epoxy resin composition of Shiobara would provide the benefit that a silicone component that out-migrates by effusion from a curable organopolysiloxane composition is highly curable and adherent. Nothing in the disclosures of either Amako or Shiobara teaches or suggests that the inorganic filler in the epoxy resin composition of Shiobara would provide any benefit to a curable organopolysiloxane composition. At page 8 of the Office Action, the Examiner seems to rely on the Applicants' disclosure to combine the filler of Shiobara with the composition of Amako. A conclusion of obviousness based upon a reconstruction taking into account knowledge that was not within the level of ordinary skill in the art at the time the claimed invention was made is improper hindsight, for example, knowledge gleaned only from applicant's disclosure MPEP §2145 (X)(A).

The first criterion for establishing a *prima facie* case of obviousness has not been met because there is no suggestion or motivation in either Amako or Shiobara to combine the disclosures of Amako and Shiobara because the problems to be solved differ. Furthermore, there is no

motivation to modify the composition of Amako to include the filler from the epoxy resin composition of Shiobara because nothing in the disclosures of Amako or Shiobara teaches or suggests that any benefit to the curable organopolysiloxane composition would be obtained by adding a filler from an epoxy resin composition.

Nothing in the disclosure of Amako or Shiobara teaches or suggests that the filler from the epoxy resin composition of Amako would provide any benefit to the curable organopolysiloxane composition of Amako or any curable organopolysiloxane composition. Nothing in the disclosure of Amako or Shiobara teaches or suggests that the filler from the epoxy resin composition of Amako would provide any benefit to a cured silicone member in a semiconductor package. Nothing in the disclosures of Amako and Shiobara teaches or suggests this invention. Therefore, the second criterion for establishing a *prima facie* case of obviousness has not been met because at least some degree of predictability is required MPEP §2143.02.

Even if one skilled in the art combined the disclosures of Amako and Shiobara, by adding a filler having a particle size disclosed by Shiobara to the curable organopolysiloxane composition of Amako, this would not meet the third criterion for a *prima facie* case of obviousness because not all of the claim limitations would be taught or suggested. The composition of Amako lacks component (A) used in the composition in the semiconductor package of claim 1. Component A of Amako has both alkenyl and silicon-bonded hydrogen atoms in the same molecule. Component (A) of this invention has alkenyl groups and other organic groups bonded to silicon atoms (paragraph [0029]). Component (A) of this invention does not contain silicon-bonded hydrogen atoms, as required for component A of Amako. Adding the a filler with a particle size disclosed by Shiobara to the composition of Amako does not cure this defect. Shiobara does not disclose any components corresponding to component (A) required by this invention. Adding a filler from the epoxy resin composition of Shiobara to the curable organopolysiloxane composition of Amako does not teach or suggest component (A) of this invention.

Claim 1 is not obvious over Amako in view of Shiobara because the criteria for establishing a *prima facie* case of obviousness have not been met for the reasons discussed above. If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is

nonobvious MPEP §2143.03. Claims 2-12 are not obvious because each of claims 2-12 depends on claim 1. Therefore, the Applicants request that the Examiner withdraw rejection of claims 1-12 under 35 U.S.C. §103(a) and allow the claims to issue.

The Examiner rejected claim 13 under 35 U.S.C. §103(a) as being unpatentable over Amako in view of Shiobara as applied to claim 1 above and further in view of Fjelstad because the Examiner believes Amako and Shiobara show a silicon wafer with a structure substantially identical to the present invention except for connection of a metal trace. The Examiner further argues that Fjelstad shows a semiconductor package comprising a semiconductor wafer having an active surface comprising at least one integrated circuit, wherein each integrated circuit has a plurality of bond pads, a cured silicone layer with a thickness range of 74-200 micrometers covering a portion of the active surface of the wafer except the bond pads, and a metal trace having a proximal end attached to each bond pad and a distal end lying on the surface of the cured silicone layer. The Examiner concludes that it would have been obvious to have a connection of the metal trace to a bond pad and a cured silicone layer because such a configuration alleviates stresses created between the substrate and the chip.

Claim 13 is not obvious for the same reasons discussed above for claims 1-12. The disclosure of a metal trace by Fjelstad does not cure the defects of Amako in view of Shiobara discussed above. The present invention is not obvious over Amako in view of Shiobara and further in view of Fjelstad a *prima facie* case of obviousness has not been established. Therefore, the Applicants request that the Examiner withdraw rejection of claim 13 under 35 U.S.C. §103(a) and allow all claims to issue.

The Examiner rejected claims 14-19 and 23-32 under 35 U.S.C. §103(a) over Fjelstad in view of Amako and Shiobara. The Examiner argues that it would have been obvious at the time the invention was made to utilize the disclosures of Amako and Shiobara for the compliant layer of Fjelstad to have the cured silicone layer with a specific composition as recited in the pending claim. The Examiner admits that Fjelstad fails to teach a specific silicone composition. The Examiner relies on Amako in view of Shiobara as discussed above for the specific silicone composition.

The combination of Fjelstad in view of Amako and Shiobara fails to meet the criteria to establish a *prima facie* case of obviousness for claims 14-19 and 23-32 for the same reasons discussed above for claims 1-13. A *prima facie* case of obviousness has not been established under MPEP §2143. The Applicants request that the Examiner withdraw rejection of claims 14-19 and 23-32 under 35 U.S.C. §103(a) and allow the claims to issue.

The Applicants have particularly pointed out and distinctly claimed the subject matter that they regard as their invention, and the instant invention is novel and unobvious. Reconsideration of the application is requested.

This reply is being submitted within the three month period for response to the outstanding office action. Although the Applicants believe in good faith that no extensions of time are needed, the Applicants hereby petition for any necessary extensions of time. You are authorized to charge deposit account 04-1520 for any fees necessary to maintain the pendency of this application. You are authorized to make any additional copies of this sheet needed to accomplish the purposes provided for herein and to charge any fee for such copies to deposit account 04-1520.

Respectfully Submitted,
DOW CORNING CORPORATION



Catherine U. Brown
Attorney for Applicants
Reg. No. 44,565
(989) 496-1725